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(54) Accounting machine

(57) An automatic accounting machine for the computation, accumulation and output of charges for the use of equipment, other than computers, capable of performing operations as instructed by a user, for instance copying machines, automatic or semi-automatic production machines or vending machines, where the use of such equipment is shared between individuals or jobs which have to be charged separately for such use.

The automatic accounting machine captures automatically the information on the operation of the equipment needed to compute the charges, and is also equipped to accept instruction as to which individual or job should be charged for given work.

The automatic accounting ma-

chine may or may not be integral with the equipment for whose work it charges. It may also be arranged to provide a desired degree of protection against unauthorised use of such equipment.

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## SPECIFICATION

## Automatic accounting machine

5 The subject of this invention is an Automatic Accounting Machine for copiers and similar machines. It is usual for many organisations to provide one or more copiers to carry out the document copying work required within the organisation. In addition the copier or copiers may also afford members of the organisation, such as employees, a copying facility for their own needs as an amenity. The need then arises to charge the cost of the copying to the particular job within the organisation for which the copying is done, or to the member concerned.

The same problem may also arise with other types of machines. For instance, an automatic production machine like a numerically controlled machine tool, will be used for a multiplicity of jobs. A machine for the automatic provision of an amenity such as the dispensation of beverages requires that the cost of beverages dispensed be charged to individual members or to the activity which the beverages are intended to promote.

The common feature of such machines in these situations is that they have means by which the details of the task to be carried out is defined to them, after which the task is completed automatically and that the cost of the task has to be charged to a given activity or to a particular member within the organisation.

The Automatic Accounting Machine which is the subject of this invention will automatically compute and promulgate the charges for the tasks carried out by machines as defined above, provided the accounting machine is suitably connected to the machine carrying out the task and the activity or individual to which or to whom the cost of a task is to be charged are identified to the accounting machine. The accounting machine may also be arranged to prevent or flag-up unauthorised usage, such as usage by unauthorised persons or tasks which exceed specified limits.

While this application describes the accounting machine with reference to copiers, numerically controlled machine tools and vending machines, it is meant to include all similar machines as defined above. Also, the term 'charge number' is to be understood as the identification of the job or individual within an organisation to which or to whom the cost of the task is to be charged. Typically, a charge number will be the name or number of a member or the number of a department within the organisation, possibly followed by the number of a given project within that department, with or without a further financial code.

Where copiers are provided within an organisation the usual way of accounting for the

cost of their use is for members of the organisation to fill in a form, giving name, department, job number where appropriate, number of pages in each document to be copied, number of copies of each, and based on this the total number of copies. In addition to the work this imposes on members there is the further accounting work needed subsequently to sort the forms and to compute the total charges for each charge number. Because of the cost of carrying out all this work an instrument has been made available which a member brings along with him and attaches to the copier while using it. This instrument then computes the charge for the copying and adds it to running total for the particular charge number as maintained by the instrument. The main draw-back of this method is that a separate instrument is needed for each charge number and this makes the method uneconomic.

The Automatic Machine will automatically compute and print out the charges to be debited to each charge number and also perform, where required, the further functions described later, provided the user, department or job are identified to it. To do so it has to be connected to the copier so as to provide it with information on the operation of the copier. This can conveniently be accomplished by feeding the accounting machine the electrical signals which are generated within the copier either by its controls or in order to display information on its operation to the user. Suitable switches may be added to controls which do not generate electrical signals. Where access to the electrical signals within the copier is not available, suitable converters connected to the Automatic Accounting Machine may be mechanically coupled to the controls of the copier.

The charge number may be put in by a keyboard or by some other convenient method, such as a suitably encoded card to be read by the accounting machine. The Automatic Accounting Machine contains computing and storage means. Stored within them is data on the rates to be charged for the copying work. From the settings and activations of the controls or displays of the copier the accounting machine will know how much work the copier has been instructed to do. It will then compute the charge for this work and add it to a running total maintained for each user.

On request, or automatically in specified situations, the accounting machine will print out these totals. It could also be used to print out a log of all or some of the work done on the copier. Alternatively, or in addition, to printing it may communicate the charges to some other accounting machine, either directly, by electrical or other signals or by means of some intermediate storage medium like paper tape or some form of magnetic

recording. The Automatic Accounting Machine may also be used to control, wholly or in part, the operation of the copier, as for example, to inhibit its operation if the copier is instructed to carry out more than a specified amount of work.

The Automatic Accounting Machine will have to preserve information such as the running totals or the rates for copying in the case of a power failure. This may be achieved by such means as a non-break power supply or by non-volatile storage means, such as some form of magnetic storage or read only memory or electrically alterable read only memory, by outputting some or all of the data on the onset of a power failure or by a combination of these and possibly other suitable means.

Means may also be provided in the Automatic Accounting Machine to promote and check its integrity of operation and the integrity of the information it produces.

By way of example, a particular embodiment of such an Automatic Accounting Machine, referred to as 'accounter' will now be described, with examples of its uses:-

Assume that a copier has start and stop push-buttons, rotary knobs for setting up the required number of copies and an electrical numeric display, which to begin with shows the number of copies set up and, as copying proceeds the number still to be done, so that zero is displayed when the required number of copies is produced and the copier stops. Assume further that the push-buttons generate electrical signals on activation. These signals, as well as the signals operating the electrical displays are fed to the accounter.

The accounter has a keyboard and an electrical display. The latter will display the letters 'F,F' when neither the copier nor the accounting machine have been engaged. To use the copier a user keys in the charge number, or the first part thereof, depending on how many digits can be displayed, on the keyboard and this is then displayed to him on the display to check. Assuming the number displayed is correct the user presses the 'enter' button, whereupon, assuming that the charge number, or part thereof, is one of a list of authorised charge numbers stored in the accounter, the number will be removed from the display. The remainder of the charge number, if any, is entered likewise. Having completed the entry of the charge number the user depresses the 'enter' button on the keyboard again; that is, two successive depressions of the 'enter' button indicate to the accounter that the user has finished entering the charge number. Alternatively this may be indicated by depressing an 'entry complete' key. The accounter will then display the letters 'E,F' to indicate that the copier has now been engaged but that the accounting machine is free for another user to log in while the first one is

using the copier. Should another user in fact log in before the first one has finished, the accounter will display the letters 'E,E' to indicate that both the copier and the accounter are engaged, the latter in the sense that a further user has already logged in ready to use the copier as soon as it is free.

When the first user has finished using the copier he, or she, depresses a 'finished' key on the accounter keyboard. The accounter comprises a computer, probably of the type known as a microprocessor and a store. Part of the store is probably of the type known as electrically alterable read only memory which has the property that it retains the stored information even when power is lost. When the user logs in the accounter reads out from its store the charges accumulated so far against that charge number. These will be denoted by  $T_o$ , with  $G_o$  denoting the total charges to all charge numbers, also stored in the accounter. On depression of the 'finished' key the accounter will change its display to 'F,F' if no further user has by then logged in or to 'E,F' if a further user has logged in.

As the copier operates the accounter captures and preserves a record of work being done. On depression of the 'finished' key the charge for the work just done is computed. This will be denoted by  $C$ .  $C$  is then added to  $T_o$  and to  $G_o$  to produce  $T_n$  and  $G_n$  respectively.  $T_o$  and  $G_o$  are next read out again and  $T_n - T_o + G_o$  compared to  $G_n$  as a check. If  $T_n - T_o + G_o = G_n$ ,  $T_n$  and  $G_n$  are then read from store and the check  $T_n - T_o + G_o = G_n$  is repeated to see whether the data has been written correctly into the store.

The accounter may also incorporate a key operated lock. Turning the key in the lock changes the mode of operation to a special mode in which numbers entered on the keyboard will be accepted as valid charge numbers. In this mode the accounter may also be commanded, from the keyboard, to print all or any of the totals accumulated. It may also be commanded to print out a list of all authorised charge numbers. Should a user enter a charge number, or part thereof, which does not correspond to any authorised charge number, or to the corresponding part thereof, the number entered would flash for a few seconds on the display and would then be discarded, the display being left blank for, say, a minute, to allow the user to key in the charge number, or part thereof, again. This is to allow for the correction of keying mistakes. After that time any preceding parts of the charge number would also be discarded with the appropriate combination of the letters 'F' and 'E' appearing on the display, so that a user would have to recommence entering the charge number from the beginning.

Should a user depress the 'stop' button prior to completion of the number of copies set up, the accounter will compute the num-

ber of copies actually done by subtracting from the number of copies initially set up the number shown as still to be done when the 'stop' button has been depressed. Further checks on the integrity of operations, in addition to those mentioned above may be incorporated, such as the summation of all charge numbers totals to check whether they equal the grand total, (either on an update of any one total or in other suitable circumstances), performing operations more than once and comparing results, re-trying of operations a specified number of times when checks fail, summation of programs in store to see whether they agree with the known correct totals or any one or combination of a number of the methods suitable for checking or ensuring the integrity of computer systems. Should a check fail the accounter would print out details of the copying task in the course of accounting for which the check failed and it will also attempt to return the state of the accounter to that which prevailed before the accounting for that task was begun.

Instead of a lock and key as described above the accounter may be arranged to have its mode of operation changed by the keying in of a sequence of the keys on the keyboard, this sequence being known only to authorised personnel. The code sequence could be specific to a given machine or group of machines and would require special apparatus to insert or modify. The accounter may also require that the personal number of a user wishing to operate it in special mode be keyed in, this number being checked against a list of personal numbers of members authorised to operate the accounter in special mode, such a list being stored in the accounter.

The accounter may also be arranged to check whether specified limits on any one copying task e.g. the number of copies set up, or the number of documents being copied, or the total size of a copying task are not exceeded. If a limit is exceeded it may either print out a specified warning signal (e.g. '999') or it may inhibit the operation or further operation of the copier.

Further, limits may be put on the total charges to a particular charge number, either the same limit on all numbers or individual limits for each charge number. These are then stored like the authorised charge numbers. A limit may also be placed on the total of all charges. Whichever, if any, limits are used, the accounter will print out a specified warning signal together with, possibly, information on the limit or on the charges exceeding it. The accounter may also be arranged to inhibit the operation of the copier to prevent limits being exceeded.

To cater for charge numbers containing alphabetic characters as well as numeric digits, an expanded keyboard may be provided, possibly with keys having both numeric and alphabetic designations, with or without alphabetic to numeric or vice versa shift keys.

Where an accounter is mechanically coupled to a copier the situation on depression of the 'stop' button may differ from that described above in that the accounter may not know how many copies were still to be done when the 'stop' button was depressed. A further action by the user may therefore be needed under these circumstances. This may take place at a stage after the charges are produced by the accounter or alternatively by providing the accounter with further data. For instance, the accounter may be arranged so that the user would depress the 'enter' key (or a 'cancel' key on the keyboard), then key in the number of copies shown when the 'stop' button was depressed, check it on the display for correctness, enter it by depressing the 'enter' key and only then depress the 'finished' key.

The accounter may also be used where a copier is not operated directly by many users but is normally operated by a designated operator to whom users hand over the work to be done. In such an instance the user would still have to communicate to the operator the number of copies required. However, even if this is done by attaching a slip of paper with the number of required copies on it, the work to be done by the user would still be reduced because a user would no longer have to determine and write in the number of pages in each document nor would the user need to multiply the number of pages by the number of copies and write in the product in the form.

On the other hand the accounter may make it possible to dispense with the operators altogether, since in many cases the operator is there only because his or her workload also includes the task of accounting for the copying work done. The cost of employing an operator may then be saved.

Many variations on the mode of operation of the accounter are possible. For instance, records of all or part of the tasks done may be printed out or otherwise produced; task slips for signature by users may be printed out; the charge for the task may be shown on the display when the 'finished' key is depressed, and so on.

In the case of semi-automatic or automatic production machinery, such as numerically controlled machine tools, the operator usually has to fill in some form giving data on the tasks done for each job for which the production machine is used. These forms have to be processed to charge the cost of the work done to the particular job. Alternatively the operator may have to key in this data on a terminal connected to a central accounting machine. With an accounter connected to the production machine these tasks are eliminated. Only the charge number has to be keyed in on the accounter, and the task done by the production machine is captured automatically by the accounter. Where the time, or length of time, for which the production machine is engaged on a given task also has to be captured the accounter may be provided with a

device known as a 'real-time clock' which, as is known, provides a means for doing this.

Where machines like beverage dispensers are provided by organisations for the amenity of members, they are usually coin-operated. This then creates the problem of acquiring the appropriate coins. Also, the coin acceptor mechanisms do not always operate reliably. Furthermore, if the beverages were required for, say, a meeting in connection with a given activity, it may be necessary for a member, such as an employee, to fill in a claim form for re-imbursement of expenses. This claim form then has to be processed to charge the cost of the beverages to the particular activity. If the coin acceptor mechanism were to be replaced by an account user would set up the controls on the vending machine to specify the desired beverage and then key in the appropriate charge number. The specified drink would then be delivered and its cost charged to the charge number. This would also provide much greater flexibility in fixing prices for the various beverages—with a coin-box prices are standardised as much as possible because of the engineering problems consequent upon price diversity.

The Automatic Accounting Machine may be arranged to prevent use of the machine to which it is connected unless a user or operator has first logged in. A still higher degree of security may be provided if intending users or operators first have to identify themselves by means such as keys or suitably encoded identity passes. Still higher security may be provided if further such means are also needed for the identification of the charge number.

Many variations on the preceding descriptions will occur to those versed in the art of designing real-time computer systems or to those familiar with the applications to which the Automatic Accounting Machine might be applied.

#### CLAIMS

1. An automatic accounting machine for the computation, accumulation and output of charges for the use of equipment, other than computers, capable of performing operations as instructed by a user, where the use of said equipment is shared between individuals or jobs which have to be charged separately for such use, said automatic accounting machines being capable of capturing for itself, by suitable connections to said equipment, information on the operation of said equipment required to compute the charges and said automatic accounting machine also having means for accepting instruction as to which individual or job should be charged for given operations.

2. An automatic accounting machine as in claim 1, built integrally with the equipment for the use of which it will compute the charges.

3. An automatic accounting machine as in claim 1, or claims 1 and 2 for a copying machine.

4. An automatic accounting machine as in

claim 1, or claims 1 and 2, for an automatic or semi-automatic production machine.

5. An automatic accounting machine as in claim 1, or claim 1 and any combination of claims 2 to 4 which affords any degree of protection against unauthorised use of the equipment for which the accounting machine will compute the charges.

6. Automatic accounting machinery substantially as described.

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